

**QUESTIONSHEET 1**

anthers/stamens; ovules/carpels/ovary; dioecious; protandry; anther; stigma; cross pollination; genetic variation; holly/yew/any other valid example;

**TOTAL 9****QUESTIONSHEET 2**

(a) A = stigmas; B = ovary/fused carpels; C = filament; D = anther;

**4**

(b)(i) wind;

**1**

(ii) feathery stigmas give a large surface area (to catch pollen);

large hanging anthers to release much pollen (into wind);

perianth/other floral parts reduced in size (to allow free access of wind to male and female parts);

**3****TOTAL 8****QUESTIONSHEET 3**

(a) (i) A = stigma; B = style; C = ovary (wall); D = ovule; E = filament; F = anther;

G = keel petal; H = receptacle; I = nectary; J = sepal;

**10**

(ii) anthers + ovules;

**1**

(b) A receives the pollen grains from the pollinating bumble bee/bee/insect;

B holds the stigma high to catch the pollen from another plant before the insect is dusted with pollen from this plant;

style hairs sweep pollen from anthers onto insect;

G pushes downwards under the insects' weight making the stigma/style jerk upwards to hit the insect/dust it with pollen;

I produces nectar which the bee has to push into the flower to collect;

**4****TOTAL 15****QUESTIONSHEET 4**

(a) (i) A = pollen grain; B = pollen tube; C = male nuclei; D = tube nucleus; E = micropyle;

F = embryo sac/female gametophyte; H = egg cell; G = endosperm nuclei; I = integuments;

**9**

(ii) one of the male nuclei fuses with the egg nucleus to form a zygote;

the other male nucleus fuses with the primary endosperm nucleus to produce a triploid endosperm nucleus;

**2**

(b) embryonic root/radicle;

embryonic shoot/plumule;

(one or two) seed leaves/cotyledons;

**3****TOTAL 14**

**QUESTIONSHEET 5**

- (a) the ovules develop into seeds;  
the testa of the seed has one scar/is formed from the integuments of the ovule;  
the fruit develops from the carpels/ovary and contains the seeds;  
the pericarp of the fruit develops from the carpel/ovary wall/has two scars; 4
- (b) monoecious plants have separate male and female flowers on the same plant;  
e.g. hazel/cucumber/any other correct example;  
dioecious plants have male flowers on one plant and female flowers on another plant;  
eg. holly/yew/any other example; 4
- (c) in protandrous flowers the male organs mature before the female;  
eg. sage/rosebay willow herb/dandelion/any other correct eg;  
in protogynous flowers the female parts mature before the male;  
eg. bluebell/figwort/any other correct example; 4

**TOTAL 12****QUESTIONSHEET 6**

- (a) transfer of pollen from the anthers to the stigmas;  
of different plants of the same species; 2
- (b) (i) generative nucleus divides to form the two male nuclei/transfer of male genetic material to the offspring;  
tube nucleus (probably) regulates growth of pollen tube; 2
- (ii) mitosis and meiosis; (both required/reject mitosis or meiosis) 1
- (iii) sculptured/rough surface aids attachment to stigma/insect hairs/setae/thickness may resist dessication/fungal attack/decay; 1
- (iv) exine would be thin/smooth;  
grain would be smaller/lighter; 2
- (c) (i) measured diameter across AB = 30 mms (allow 29.5 – 30.5) ;  
  
magnification =  $\frac{30 \times 1000}{300} = 100X$ ; 2  
(remember that 1mm = 1000  $\mu$ m)  
(allow correct calculation consequential on the measurement of AB)
- (ii) wall of pollen tube is an extension of the intine;  
male nuclei pass down length of tube to tip;  
tube nucleus may be at tip of tube or lag behind male nuclei;  
tube may be blocked behind male nuclei by plugs of callose; max 3

**TOTAL 13**

**QUESTIONSHEET 7**

- (a) food required for germination (until seedling can photosynthesise);  
sugar/starch/oil/fat for energy/ATP supply;  
protein for amino acid supply for growth;  
weight tends to push seed into soil/keeps seed at soil surface/stops it blowing away; **max 3**
- (b) sugar/sweetness attracts animals to eat the fruit (and so aid dispersal);  
seeds inedible and discarded away from parent plant;  
seed coat/endocarp resistant to digestive juices of animal so seeds pass out in faeces;  
if fruit not eaten it will soon be broken down by bacterial/fungal decay to release seeds (into nutrient rich soil); **max 3**
- (c) gibberellins can break seed dormancy/initiate germination;  
stimulate seeds to synthesise amylase/diastase/proteases/lipases;  
to digest starch to maltase/proteins to amino acids/oils or fats to fatty acids and glycerol;  
stimulate plumule/stem elongation when seedling formed; **max 3**
- (d) exine of pollen grain resistant to decay;  
especially in anaerobic/acidic conditions of peat;  
each species has a characteristic exine pattern and can be recognised;  
depth of pollen in the peat gives an estimation of age; **max 3**
- TOTAL 12**
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**QUESTIONSHEET 8**

- (a) (i) A = petal;  
B = receptacle;  
C = sepal;  
D = anther;  
E = filament;  
F = carpel; (reject 'carpal' which is a wrist bone/reject 'ovary' – the ovary is all the carpels together) **6**
- (ii) it means that the flower can be cut vertically along any axis to give mirror-image/equal halves; **1**
- (iii) flower can disperse seeds (equally) easily in all directions;  
flower can disperse pollen onto insects/bees (equally) easily in all directions;  
flower can be seen/smelt (equally) easily from all directions by insects/bees;  
insects/bees can land on flower (equally well/easily) from all sides; **max 3**
- (iv) attracts insects/bees to flower to carry out insect pollination;  
provides a sugar/food/energy source for insects/bees;  
via bees provides honey for human use/other animals/bears/wasps which raid bee colonies; **max 2**
- (b) (i) in the megaspore mother cells/potential embryo-sac/nucellus/ovules;  
in the microspore mother cells/microsporangia/pollen sacs of anthers; **2**
- (ii) only mitosis involved;  
creepers/stolons grow from parent plant over soil surface;  
originate from axillary buds;  
where they touch the ground/axillary buds on the stolon develop roots and shoots (forming new plants); **max 3**
- TOTAL 17**

**QUESTIONSHEET 9**

Floral parts	Characteristic features	
	Insect pollinated	wind pollinated
Calyx (Sepals)	large, green or brightly coloured;	reduced in size/absent; never brightly coloured;
Corolla (Petals)	large; brightly coloured; ref nectary/nectar/honey guides/scented;	reduced in size; never brightly coloured;
Androecium (Stamens)	filaments short and strong/stamens enclosed in corolla; anthers release pollen towards inside of flower;	Filaments long/pendulous/ stamens not covered by corolla; anthers larger/release pollen to outside of flower;
Pollen	rough/thick exine/larger grains; less produced;	smooth exine/light and dusty; huge amounts released;
Gynaecium (Carpels)	large/sticky stigmas; short styles within corolla;	large feathery stigmas; long styles extend beyond corolla;

**TOTAL 20****QUESTIONSHEET 10**

(a) (i) 9; (ii) 18; (iii) 27; (iv) 9; (v) 18; (vi) 18;

**6**

- (b) pollen grain germinates to produce pollen tube;  
stimulated by sucrose secreted by stigma;  
pollen tube grows (along style) to enter ovule/embryo sac via the micropyle;  
tube nucleus passes into tube and may control its growth;  
pollen tube growth directed by chemotropism;  
generative nucleus divides mitotically;  
to produce two male nuclei;  
male nuclei enter/pass along pollen tube into embryo sac;  
ref to double fertilisation;  
one male nucleus fuses with egg cell nucleus to form a zygote;  
other male nucleus fuses with (diploid primary) endosperm nucleus to form a triploid endosperm nucleus;

**max 8****TOTAL 14**

**QUESTIONSHEET 11**

- (a) False;  
second male nucleus is involved in endosperm formation;  
does not contribute to genotype of offspring;  
only one of the male nuclei fuses with the egg nucleus to pass genetic material to the offspring (as in sexual reproduction generally); **max 3**
- (b) True;  
cold period stimulates development of gibberellins;  
which trigger synthesis of enzymes required for germination;  
amylase/diastase/lipase/protease; **max 3**
- (c) False;  
ethene stimulates fruit ripening (after growth);  
fruit growth stimulated by auxin/gibberellin/cytokinin;  
ref to synergistic affect of auxin with gibberellin/cytokinin on growth; **max 3**
- (d) False;  
pollen tubes grow towards to a chemical secreted by the ovule/embryosac;  
this is chemotropism and not chemotaxis (where the whole organism moves towards the chemical); **3**
- TOTAL 12**
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**QUESTIONSHEET 12**

- (a) (i) forms the fruit wall/pericarp;  
(ii) form the seed coat/testa;  
(iii) shrinks/disappears as its food content is used (by the germinating seed)/  
increases in size as it accumulates (food for germinating seed);  
(iv) develops into the stem/shoot;  
(v) develops into the root/root system;  
(vi) shrivel/fall off; **6**
- (b) seed only has the scar due to the attachment to the carpel/fruit wall/funicle;  
fruit has a scar from the shrunken stigma/style and from its attachment to the receptacle; **2**
- (c) (i) cover several flowers with transparent plastic bags until fully developed;  
remove bag when flower is fully open and count number of bee visits;  
replace bags over flowers after 1 visit, 2 visits, 3 visits and so on (to prevent further visits);  
do several times/replication;  
allow apples to develop fully (still in transparent bags);  
cut mature apples (transversely/horizontally) and count number of seeds;  
(give credit for other suitable methods) **max 5**
- (ii) select many ripe apples of different weights;  
but same variety;  
weigh the individual apples;  
cut them in half (horizontally/transversely) and count number of seeds set/developed in each apple; **max 3**
- TOTAL 16**